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ABSTRACT

Assessment of school aged youngsters is an omnipresent decision making activity; intervention planning is an important component of this decision making. A child's strengths and weaknesses may be useful indicators on which to plan instructional programs; unfortunately, they often are not identified as a result of general assessment practices. Diagnostic testing offers some advantage in this regard in that a child's test performance is evaluated relative to tentative hypotheses about learning problems. In practice, the principles of diagnostic testing may be applied to many different types of behaviors samples. A procedure for analyzing word recognition samples relative to applied information in word-attack skills is presented. The process involves administration of a formal reading test with subsequent stages of error analysis and teaching. (Author/DB)

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Monograph No. 14

USING ASSESSMENT INFORMATION TO PLAN READING INSTRUCTIONAL PROGRAMS: ERROR ANALYSIS AND WORK ATTACK SKILLS

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Abstract

Assessment of school-aged youngsters is an omnipresent decision-making activity; intervention planning is an important component of this decision making. A child's strengths and weaknesses may be useful indicators on which to plan instructional programs; unfortunately, they often are not identified as a result of general assessment practices. Diagnostic testing offers some advantage in this regard in that a child's test performance is evaluated relative to tentative hypotheses about learning problems. In practice, the principles of diagnostic testing may be applied to many different types of behavior samples. A procedure for analyzing word recognition samples relative to applied information in word-attack skills is presented.

Using Assessment Information to Plan Reading Instructional Programs: Error Analysis and Word Attack Skills

Assessment of children takes many forms; Salvia and Ysseldyke (1978) have distinguished several purposes of testing and assessment. They suggested that screening, identification, placement, programming, and evaluation decisions were made as a result of the administration, scoring, and interpreting of some tests. Clearly, the most important purpose of assessment should be programming. Teachers and other professionals who develop systematic instructional programs must do so based upon appropriate and relevant assessment information; diagnostic testing practices offer assistance in this regard. Diagnostic testing in reading involves identification of specific strengths and weaknesses in reading skill development as a basis for subsequent remedial programming. A variety of different types of diagnostic reading tests are available (Salvia & Ysseldyke, 1978).

Diagnostic Reading Tests and Reading Samples

Sampling of reading behavior may occur as a result of various assessment strategies. Bond and Tinker (1967) suggest that group survey and diagnostic tests, informal procedures, and detailed individual techniques may be useful in such analyses of "reading difficulties." In discussing the "detailed" techniques, they repeatedly indicate that observing, recording, and analyzing errors are recommended practices in diagnosing reading problems. Several diagnostic devices are illustrative of the "state of the art" in diagnostic testing in reading.

The Woodcock Reading Mastery Test (Woodcock, 1973) is an indivi-

dually-administered test of reading skill development. It provides four measures of achievement: age and grade scores as well as percentile ranks and standard scores. The items are organized into five subtests, each sampling somewhat different behaviors. While the Woodcock can be used as a norm-referenced or criterion-referenced test, its value should be in its use as a criterion-referenced measure. This simply means that one should be able to analyze a child's performance relative to the specific areas, subtests, and/or items he/she correctly and incorrectly answers. It is assumed that such a procedure will enable patterns of skill development to be ascertained and remedial programming attempts to be facilitated; however, "how much the test can help in doing so depends largely on the interpretative skill of the individual classroom teacher" (Salvia & Ysseldyke, 1978, p. 195).

The Gates-McKillop Reading Diagnostic Tests (Gates & McKillop, 1962) consist of a battery of 17 individually-administered subtests of reading skill development. Grade and interpretative scores are provided and skills are rated as indicative of various levels of development in reading. "The test battery requires very little experience to administer correctly but considerable sophistication to interpret" (Salvia & Ysseldyke, 1978, p. 178).

The Durrell Analysis of Reading Difficulty (Durrell, 1955) was designed to identify "weaknesses and faulty habits in reading which may be corrected through a remedial program" (p. 3). Salvia and Ysseldyke (1978) suggest that results from the Durrell "may be useful in reaching tentative hypotheses regarding the nature of a child's reading difficulties," (p. 182, emphasis added), if the qualitative information

provided by the test is analyzed rather than the scores.

In reviewing diagnostic reading tests, Salvia and Ysseldyke (1978) repeatedly indicate that the utility of such tests rests on the teacher's or examiner's interpretation of how the child earned his/her scores. There is no magic in diagnostic testing other than that brought by a careful analysis of the nature of a child's performance. It would seem that the principles of diagnostic testing could be applied to reading performance on any sample of reading behavior with potential benefit.

Analysis of Reading Behavior

All tests are samples of behavior. Reading tests sample various types of reading behaviors; some require simple letter and word recognition responses while others include reading rate, comprehension, and other activities in required test responses. Obviously, errors may occur on any reading test; analysis of those mistakes provides the data on which diagnostic assessments of reading skills are based. Salvia and Ysseldyke (1978) discuss errors commonly made in oral reading performances; they included mispronunciations, omissions, insertions, and other similar mistakes in their discussion.

Word-attack skills are those used "to derive the meaning and/or pronunciation of a word through phonics, structural analysis, or context clues" (Ekwall, 1970, p. 4). Difficulties in analyzing (i.e., attacking) words are prevalent reasons for referring youngsters for diagnostic evaluations and/or classifying them as "disabled readers." Various diagnostic reading tests include analyses of word attack skills (cf. Salvia & Ysseldyke, 1978). Some of the errors that may be observed

in such samples of behavior include faulty vowel and consonant usage (e.g., dig as dug or send as sent), letter or word reversals (e.g., dig as big or was as saw), and addition of sounds (e.g., tack as track) (Bond & Tinker, 1967). Any sample of reading behavior may be analyzed for word-attack problems. One such sample may be obtained from the reading recognition subtest of the Peabody Individual Achievement Test (PIAT); it is a set of 84 items assessing skill development in matching letters, naming upper and lower case letters and reading words in isolation (Salvia & Ysseldyke, 1978). Age and grade equivalents and percentile and standard scores are available measures of achievement from the PIAT for school-aged children. The reliability and validity of the PIAT have been investigated and reported to be adequate (Dunn & Markwardt, 1970; Salvia & Ysseldyke, 1978); the content validity was based on "extensive reviews of curriculum materials used at each grade level" (Dunn & Markwardt, 1970, p. 50). The format of the subtest varies; the main "reading" items require the child to read words presented in unrelated horizontal sequences. The items are arranged in order of difficulty with easier items occurring in the initial portion of the test. A basal and ceiling procedure is utilized to establish the appropriate items for a particular child.

While the PIAT may be useful for one purpose of educational assessment (i.e., screening or placement), one tends to find it inadequate with regard to a second purpose (i.e., educational planning); that is, the utility of the reading subtest as a diagnostic test has not been demonstrated. This is not surprising, since the test was not intended to be diagnostic. However, the problem is not with the content

of the items but more with the format of score representation and subsequent interpretation. It is difficult to translate age or grade equivalent scores into meaningful instructional objectives based on the summary information reported by the PIAT. What specifically does one teach a child who obtains a 3.2 on the reading recognition subtest?

An analysis of the items of the PIAT reading recognition subtest indicates that several word patterns are present within the specific words that are "read." However, the number of words selected from various patterns is extremely small (e.g., one of over 400 possible CVC words is included). Regardless of this obvious limitation, it may be useful to analyze the types of errors a child makes in this small reading sample as a basis for tentative hypotheses regarding the nature of the child's reading problems. For example, a child who reads run as "ran" makes a different error than one who reads run as "cat" or "ruf" or "ru." A careful interpretation and analysis of the child's performance can be highly suggestive of possible follow-up assessment necessary for developing programming strategies. The overall grade score has its utility; however, it is the error analysis that makes programming possible and practical.

Given this information, one can begin to use the PIAT reading recognition subtest (or any simple measure of reading behavior) within a diagnostic testing framework; for example, specific strengths and weaknesses within word attack skills may be identified in a procedure similar to that of other diagnostic reading tests. The wide range of content coverage does not facilitate this process; in fact, basal and ceiling procedures may be such that only a narrow range of content is

sampled. However, error analysis within the list of incorrectly read words may provide meaningful information for educational planning beyond that provided by global scores. To facilitate this process, a more detailed analysis of word attack skills is clearly necessary. A list of 15 CVC words with stop and continuous initial sounds is presented in Table 1; a similar list of nonsense words is presented in Table 2. A teacher who suspects (as a result of administration and analysis of any formal reading test) that a child is having difficulty with initial, medial, or final sounds in the CVC combinations might ask the child to read each of these lists or one similar to that in Table 3. Careful recording and subsequent error analyses of the child's performance could then provide direction for any teaching activities and/or remedial programming efforts.

Insert Tables 1 - 3 about here

It appears then that diagnostic testing in reading is a process which can be applied to the results obtained from any formal assessment device. The process takes the following steps:

1. A formal measure of reading recognition is administered, scored, and interpreted relative to its designated use (i.e., norm or criterion referenced).

2. Errors within the actual set of words read are recorded and identified as a representative of word types (e.g., CVC, CVCC, etc.).

3. Reading performance on a general set of word types (e.g., CVC, CVCC, etc.) is obtained and errors are again noted.

4. Reading performance on specific sets of word types (e.g., CaC, CeC, etc.) is obtained and errors are noted.

5. All errors are analyzed and teaching activities are designated based upon results of error analyses.

To adequately perform diagnostic testing in reading, as suggested, several sets of information must be available to a teacher. The first is a hierarchy for word types; one possible arrangement is presented in Table 4. Second, the teacher must know what items from the hierarchy are present in the formal test being administered. This is most easily accomplished by analyzing the test being administered and noting the word types present in the reading recognition list. Third, the teacher must have available, sets of word lists for each type of word being tested. Examples of some of these lists are presented in Tables 1 to 3; others can easily be constructed. Finally, the teacher must have a teaching strategy through which new skills may be taught once the nature of those skills is identified (diagnosed).

Insert Table 4 about here

Sample Application of Suggested Technique

The following example is presented to illustrate the diagnostic testing-to-teaching sequence; each step in the process has been noted.

Step 1. William has been administered a standardized test (i.e., the PIAT). The grade equivalent score is 1 1/2 years below his actual grade placement; William has a problem in reading.

Step 2. An error analysis of his performance suggested that he has adequate knowledge of sounds in isolation as well as CV combina-

tions. William consistently missed CVC and more difficult words.

Step 3. William was administered an informal test that included a variety of word types (i.e., CVC, CVCC, CCVC); his performance suggested inconsistent skill development with regard to CVC words.

Step 4. William was administered an informal test in which particular forms of CVC words were included; his performance (see Table 5) was analyzed. This error analysis suggested that William had learned certain words as part of a "sight" vocabulary (all words in the informal test were phonetically regular, yet William's performance was characterized by correct and incorrect responses). For example, bad, kit, gun, top, and other words may have been introduced in earlier texts that he has seen. He has learned the words, not the phonics rules. This has been deduced via inspection of the nonsense words that appear in the lists. William does not appear to know the sounds of several letters and is simply transferring the nonsense word into a word that is familiar to him. For example, bab becomes "bat," paf becomes "pat," and gan becomes "gun." Additionally, the process error analysis suggests that this child substitutes b for d only when the letter is in the initial position.

Step 5. After such an analysis, William's teacher has tentative hypotheses on which to base instructional activities for William.

Insert Table 5 about here

Follow-up Activities

After having engaged in this form of diagnostic assessment process,

a teacher must evaluate the extent to which any intervention has been effective. Diagnostic testing extends beyond the administration of standardized tests and informal word lists; it encompasses evaluation of progress as a result of intervention. An effective means to facilitate this aspect of testing for teaching is the administration of "probe" sheets. These sheets should contain letter combinations corresponding to the areas of difficulty noted on the formal assessment; for example, the words used in Tables 1 and 2 could be placed on a "probe" sheet for a student who has displayed a consistent error with words that have the CaC pattern (see Table 5 for example). Systematically, such assessment samples presented to the student for selected time intervals could provide useful progress data and the results could be recorded for future reference.

The use of direct and daily measurement using "probe" sheets may be an effective means of monitoring student progress (Deno & Mirkin, 1977; White & Haring, 1976). By defining the specific instructional goal in terms of performance per period of time (i.e., CaC words correctly produced per minute), both the teacher and student are fully aware of what must be accomplished. This goal is usually described with regard to a particular mastery level of the skill and provides a basis for evaluating the effectiveness of interventions.

Summary and Discussion

The intent of this paper was to present a procedure for a teacher to follow when engaging in diagnostic testing in reading. The initial stage of that process involves administration of a formal reading test with subsequent stages of error analysis and teaching. Error analyses

may provide information regarding the step in a hierarchy of reading skills on which a child's current performance places him/her (e.g., (CVC), and also, the specific level within the hierarchy step that the child has acquired skills (e.g., CVd, not CVp). Additional types of error analyses may be useful depending on the level of reading skills and "tentative" hypotheses for problems. With information of this type, the practice of diagnostic teaching should be greatly facilitated.

That the use of the error analysis techniques provides more information than merely reporting general achievement levels (e.g., 5.3) should be obvious; however, it by no measure defines disabilities or unequivocally identifies problem areas. When a child performs poorly on a test item, several explanations are possible. First, the child may not have developed the skill being tested; that is, the test performance is a valid indication of a problem. It is also possible, however, that the test performance incorrectly identifies a problem area (i.e., false positive error). This may occur for a variety of reasons. For example, the nature of the behaviors sampled by the particular test may not match the way an individual child best handles information or performance (Salvia & Ysseldyke, 1978); the PIAT reading subtest requires recognition of a relatively few words and word types. It may be that some children can read similar type words in other presentation formats.

It is also possible that chance errors have occurred within a subgroup of items. The child may have lapsed in his/her attention to the task, may have misunderstood the item, and/or may have applied an inappropriate model (i.e., long vowels for short) to the item. In analyz-

ing errors, one of several patterns may occur. The child may miss only one type of word (e.g., CCVe); or he/she may miss particular forms of a word within specific types (e.g., STVCE); or forms within patterns may be inconsistently missed; and/or several types may be consistently missed. It is the responsibility of the teacher/diagnostician to attempt to analyze patterns of errors and to develop tentative hypotheses with regard to strengths and weaknesses. These hypotheses may then be verified with subsequent informal assessment.

It should be evident that there are problems involved in testing children. Regardless of this issue, the use of a diagnostic testing approach, within the range of the behaviors sampled, provides more information from which to plan meaningful educational programs than simply recording global performance scores.

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Footnote

Bob Algozzine is also affiliated with the Institute for Research on Learning Disabilities at the University of Minnesota.

Table 1

Stop and Continuous Sound CVC Words for Informal Assessment

Stop	Continuous
bad	nab
tap	hat
jam	lap
pad	mad
dad	sap
cat	vat
can	van
tag	fad
pan	rat
pal	ham
jag	map
gap	mat
gag	wax
dam	yam
cab	sat

Table 2

Stop and Continuous Sound CVC Nonsense Words for Informal Assessment ("a" vowel only)

Stop	Continuous
bab	mab
cas	mal
daf	faz
dal	wat
gac	zal
gan	rab
jal	saf
jax	vab
kag	maj
kam	lac
paf	hax
tas	hac
tat	fac
tav	yad
gat	lat

Table 3

Performance on An Eight Year Old on CVC Informal Assessment

Stop		Continuous	
Stimulus	Response	Stimulus	Response
bad	bad	mab	mat*
cas	sas*	val	val
gal	gal	lat	lat
keg	keg	saf	sat*
bab	bat*	zab	zad*
ten	ten	fat	fat
jig	jig	vab	vad*
kit	kit	lac	las*
paf	pat*	hat	hat
tav	tav	yad	yud*
gat	guhat*	wat	wait*
dal	bal*	fab	fab
gun	gun	zal	sale*
top	top	had	had
cat	cat	mat	mat
jax	jak*	hax	hat*
gan	gun*	lab	lab
kag	cat*	maj	mat*
daf	bat	sat	sat
pip	pip	fac	fas*

* = error response

Table 4

Sample Hierarchy of Word Attack Skills

I. Preliminary Skills

- A. knows letter names
- B. knows left-to-right progression
- C. knows letter sounds
  - 1. consonants
    - a. continuous: f, h, l, m, n, r, s, v, w, y, z
    - b. stop: b, c, d, g, j, k, p, qu, t, x
  - 2. vowels
  - 3. digraphs
- D. discriminates letter sounds without symbols
  - 1. initial position
  - 2. final position
  - 3. medial position
  - 4. combinations
- E. discriminates letter forms without sounds
  - 1. initial position
  - 2. final position
  - 3. medial position
  - 4. combinations

II. Blending Skills

- A. knows short vowel blends
  - 1. two sound blends (CV, VC): at, in, ob, sa, ro, fa...
  - 2. three sound blends (CVC): hat, sit, wug, ship, chop...
  - 3. four sound blends (CVCC, CCVC): fond, self, slip, bran...
  - 4. five, six, seven sound blends: grasp, strip, stamps, scratch...
- B. knows long vowel blends
  - 1. double vowels, vowel digraphs: boat, rain, meet...
  - 2. final "e": bite, stripe, bake, scrape...
  - 3. open-ended vowels: go, so, hi...
  - 4. ending sound of "y": fly, sky; baby, happy...
- C. knows "r" controlled vowels
  - 1. ir, er, ur: bird, stir, fern, verb, burst, hurl...
  - 2. ar: star, marsh, dark...
  - 3. or: scorn, born, for...
- D. knows dipthongs
  - 1. oi, oy: join, toy...
  - 2. ow: cow, brow...
  - 3. ou: cloud, proud...
  - 4. oo: food, wood...
  - 5. ew: flew, threw...
  - 6. ue, ui: fruit, true...
  - 7. ey: hey, prey...
- E. knows modified sounds of "a"
  - 1. au: haul, maul...
  - 2. aw: claw, straw...
  - 3. all: small, ball...
- F. knows "ng" and "nk" endings
  - 1. ang, ong, ung, ing: hang, strong, sung, sing...
  - 2. ank, onk, unk, ink: spank, honk, trunk, sink...

Table 5

Example of Probe Sheet for CaC Pattern

BAD	TAP	PAD
CAN	GAG	HAT
VAN	MAP	YAM
FAD	NAB	LAP
JAG	HAM	SAM
PAL	TAG	CAT

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